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Investigating the Signs, Symptoms, Diagnosis and the Principal Effect of Aging on Leukemia Patients

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Abstract

The body is made up of trillions of living cells. Normal body cells grow, divide to make new cells, and die in an orderly fashion.In childhood, normal cells divide faster to allow the person to grow. In adults, most cells divide only to replace worn-out or dying cells or to repair injuries. There is longstanding recognition of the striking association between ageing in humans and the incidence rates of many common types of cancer. Cancer begins when cells in a part of the body start to grow out of control.Leukemia is a form of cancer that targets the blood. The bone marrow, to some extent, controls the natural life cycle of these cells (formation, growth, function and death). In many instances, leukemia is the result of disturbing the control over white blood cells (WBCs) life cycle. The aim of the present study was to review the signs, symptoms, diagnosis, investigation of the other variables such as aging, and the treatment options that have emerged during the past several years in different aging group to establish guidelines for the characterization of acute leukemias and provide a uniform basis for the diagnosis of the various types of these hemopoietic malignancies which should be helpful for future multinational clinical and laboratory investigations.

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Introduction

Leukemia is the name of a group of cancers of the blood cells. The increased growth of the white blood cells leads to overcoming of the health white cells, red cells, and platelets. As a result, the normal cells are not able to function probably. In the 1920s and1930s, cancer was a substance of the United States Congress and consequently an Act of Congress set up the National Cancer Institute in 1937. The National Cancer Institute was unified into the prior National Institute of Health by the Congress in 1944. In 1948, the title was changed from the National Institute to the National Institutes of Health and other organ-system-focused institutes or disease-oriented institutes were then set up. Afterwards, institutes allocating with eras of life were founded (the National Institute of Child Health and Human Development in 1962 and the National Institute of Aging in 1974). At present, there are 20 research institutes, numerous extra research bases, and the National Library of Medicine [1,3,6] .

In a while, the Second World War prohibited much growth till the War's termination and an era of civil revival followed. The World War Two did give rise to the essential to analysis the influences of and counter amounts for sulfur mustard gas contact, a weapon that had been exploited in the First World War. The mixture of three nitrogen mustard complexes, given the mysterious wartime designations HN1, HN2, and HN3, allowed their analysis in solution, not as a gas, and their management intravenously, expediting their analysis in laboratory animals and later human beings. The finding that they shrank lymphatic tissue in lymphomabearing animals, ultimately, leaded to clinical tests of these agents in cancer patients in the mid-1940s [1]. Prominent tests were realized in patients with Hodgkin's disease. Folic acid antagonists, primarily aminopterin, were presented in 1947 for the treatment of childhood acute leukemia at the instigation of Sidney Farber at the Boston Children's Hospital and Harvard Medical School and via the vital teamwork of the marvelous synthetic chemist Yellapragada SubbaRow of Lederle Laboratories [2]. By 1950, the first commercially obtainable glucocorticoid hormone, cortisone, was being used as an agent in lymphoid malignancies [3].

In the initial of 1950s, an intensive attempt was started in order to attack cancer across major research and the detection of further drugs for therapy. A transformation instigated at the National Cancer Institute and the handful of centers concentrated on cancer drug progress. Both international sites, the Chester Beatty Research Institute in Britannia under the leadership of Alexander Haddow and the University of Tokyo under the guidance of Tokyo Yoshida, were outstanding [3,4]. In these attempts to advance cancer therapy, acute leukemia became a notable focus, in part for the accessibility of aminopterin and glucocorticoids, the first active agents for childhood acute leukemia that convinced transient remissions and restitution of normal lymphohematopoiesis, the heart-rending influences of acute leukemia on suffered children and their families, and the relative availability of blood and marrow cells to study the influences of novel treatments [4].

Acute leukemias have an unusual age-associated incidence with a peak at a young age (2-5 years) followed by a later increasing incidence with age in adults. In this instance, however, the biological and genetic subtypes of leukemia are distinct at different ages [4,13]. The biological basis of this link is likely to be multi-factorial including both age-associated decline in anti-oncogenic functions, such as repair of oxidative damage to DNA, timing of etiologic exposures and/or protracted time required for accumulation of a full set of oncogenic mutations

[4, 14, 15].

Existing analysis of the rise in cancer occurrence that convoys aging principally concentrates on the multistep process of tumorigenesis. Nevertheless, progressive T- and B-cell functional deficits improve with aging, a decline termed immunosenescence [4,5,6], which may also be a factor.

A critical drawback in studies of aging has been that of unique changes predictive of vulnerability to infection, autoimmunity and cancer from those changes leading to these very conditions. The majority of the studies are cross-sectional, comparing aged and younger groups. In addition, the health condition of numerous of the aging in these studies is not well defined. Longitudinal studies of the aged and the establishment of performance status criteria under the SENIEUR protocol has addressed this distress, defining the healthy aged [7]. Longitudinal studies of the healthy aged have identified immune risk phenotypes (IRPs) by associating immune changes, such as low CD4þ cell numbers and inverted CD4:CD8 ratios, with poor prognosis [8,9]. While differences have been found [6], these studies offer the strongest characterization of immune system changes during aging.

Generally, the most conventional cancer in children is leukemia. After disordering the functions of the immune system, causing fevers and infections, the cancer affects on the production of other blood cells, leads to anemia and bleeding problems. An affected child may look pale, be frequently breathless and bruise and bleed easily and for a long time [8]. Leukemia cells can also take place in various organs in the body generating some symptoms such as headaches, confusion, joint / bone pains, and painful swellings [4,5].

The cancerous condition of leukemia sets off when the DNA of one or more white blood cells is damaged or mutated. In several cases, DNA damage leads to the activation of oncogenes and deactivation of tumor suppressor genes. The irregular DNA is imitated and passed on to countless cell generations, which rather than maturing and dying off incline to increase and accumulate within the body causing the problems of leukemia [9].

Epidemiology

While no age group is immune to the development of leukemia, most patients with this disease are elderly. In the Western hemisphere, the frequency of leukemia increases with age, up to an estimated incidence of 10/ 100,000 in the elderly population [10]. In1992, in the United States, the frequency in persons aged **75** years was nearly 16/ 100,000, whereas the whole frequency for all age groups was 2.6/100,000 [11]. Recent data from northern England show that the frequency in the elderly is nearly 6/100,000, with a trivial propensity to involve men more often than women [5,9]. This rate is approximately six times that of the general population. Remarkably, mortality trends seem to be on the upswing in elderly persons in comparison to younger individuals. This augmented mortality possibly reflects a rising incidence of leukemia in the elderly, which in line may be influenced by better diagnostic techniques, altered classifications of myelodysplastic syndrome (MDS), or increased risks [10].

The serious changes characteristic of immune senescence take place in the T-cell populations. While general arithmetical shifts have been detected [12], it is the changes in subpopulations that bring about the functional deficits of aging and aggravate recovery from therapy. Three main changes have been detected:

a decline in the number of ingenious cells because of diminished thymopoiesis; a rise in the number of memory cells leading to increased cytokine production; and a dysfunctional accumulation of activated effector cells of limited T-cell repertoire occupying T-cell space.

Types of leukemia

There are 4 main types of leukemia:

1) Acute myeloid / myelogenous leukemia (AML): The first element in categorizing leukemia is whether most of the irregular cells are mature or immature (whether they look like normal white blood cells or stem cells). In acute leukemia, the bone marrow cells cannot mature accurately. AML affects myeloid cells and grows quickly. Leukemic blast cells collect in the bone marrow and blood. Immature leukemia cells carry on replicating and building up. Without treatment, the majority of people with acute leukemia would live only a few months. Some types of acute leukemia retort well to treatment, and many patients can be cured. Other types of acute leukemia have a less satisfactory stance. About 15,000 Americans will be diagnosed with AML in 2013. Most (about 8,000) will be 65 or older, and about 870 children and teens will get this disease [9,10].

2) Chronic myeloid / myelogenous leukemia (CML): In chronic leukemia, the cells can mature somewhat but not absolutely. These cells may appear properly normal, but they usually do not fight infection as well as normal white blood cells do. They also live longer, build up, and crowd out normal cells [9]. Chronic leukemias incline to develop over a longer period of time, and most people can live for many years. However, chronic leukemias are commonly harder to cure than acute leukemias. About 6,000 Americans will be diagnosed with CML in 2013. Almost half (about 2,900) will be 65 or older, and only about 170 children and teens will get this disease [7].

The second factor in classifying leukemia is the type of bone marrow cells that are affected.

3) Acute lymphocytic / lymphoblastic leukemia (ALL): Leukemias that start in early forms of myeloid cells – the cells that make white blood cells (other than lymphocytes), red blood cells, or platelet-making cells (megakaryocytes) – are *myeloid* leukemias (also known as *myelocytic, myelogenous, or non-lymphocytic* leukemias) [7,9,10].

4) Chronic lymphocytic leukemia (CLL): Leukemias that start in immature forms of lymphocytes are called *lymphocytic* leukemias (also known as *lymphoid* or *lymphoblastic* leukemias). Lymphoid leukemia cells may collect in the lymph nodes, which become swollen [10].

Acute lymphocytic leukemia (ALL) can cause many different signs and symptoms. Most of these occur in all kinds of ALL, but some are more common with certain subtypes. Patients with ALL often have several non-specific symptoms. These can include weight loss, fever, night sweats, fatigue, and loss of appetite [11]. Most signs and symptoms of ALL result from shortages of normal blood cells, which happen when the leukemia cells crowd out the normal blood-making cells in the bone marrow. These shortages show up on blood tests, but they can also cause symptoms, including: Feeling tired, Feeling weak, Feeling dizzy or lightheaded, Shortness of breath, fever, recurring infections, bruising easily, bleeding, such as frequent or severe nosebleeds and bleeding gums [11,12].

Risk Factors

DNA damage may be caused by a combination of genetic susceptibility factors and environmental exposures:

***Age*:** Younger patients tend to have a better prognosis than older patients. There is no set cutoff for this, but generally those younger than 50 do better than those in their 50s, whereas people in their 50s do better than those in their 60s or older. Approximately 60-70% of leukemics are older than 50 years [2,3].

Chemicals and radiation: The peril of developing acute leukemia increases in persons exposed to dangerous chemicals (benzene) or to radiation [3].

***Smoking*:** It is reported that numerous of the adult cases with leukemia are cigarette smokers [3].

***Viruses*:** The human T-cell leukemia virus I (HTLV-I) influences on acute lymphocytic leukemia (ALL). Likewise, other types of leukemia have been reported in workers who are exposed to animal viruses [2].

Genetic: Leukemia risk is raised 15-fold among children with Down syndrome. Other inherited diseases are also connected with a higher risk of developing leukemia such as: Fanconi anemia, Bloom's syndrome, ataxia telangiectasia, neurofibromatosis and Li-Fraumeni syndrome, Wiskott-Aldrich syndrome, Klinfelter syndrome, and Shwachman syndrome [3].

It is well-known that successful treatment is far less common in elderly patients with AML than in younger patients.

Conclusions

Operational treatment of the aged patient with AML is a perplexing job. Acute leukemia is obviously a different disease in the elderly than in the young, for many causes, both clinical and biologic. The old, as a group, have been understated in clinical tests. Many key prognostic variables have been recognized and explained, however, that can support the doctor to choose the suitable treatment for any individual patient. Age itself should not preclude an effort at therapy, particularly for AML, which developments very fast in the lack of treatment. After vigilant analysis of prognostic factors, in any individual patient, however, the stance may be so poor that it may be appropriate to withhold treatment. With a better understanding of the pathophysiology of AML in the elderly, more targeted and less toxic treatment regimens will become accessible. Now, however, clinicians must use an improved understanding of the disease to predict its behavior in an individual patient, so that the presently accessible treatment modalities are used most sensibly.

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